

PSYCHE.

TREATMENT PROCESSES AGAINST PHYLLOXERA VITIFOLIAE.

BY WILLIAM STEBBINS BARNARD, WASHINGTON, D. C.

The control or destruction of this notorious pest is one of the most prominent scientific problems of our day. It has baffled many experimenters even under the stimulus of a standing prize of 300,000 francs offered by the French government. The Phylloxera commission has not yet found a device worthy of the award. In its reports (1) bisulphide of carbon, (2) sulphocyanide of potassium and (3) submersion by water, are recommended as the best remedies it has found. The control of the phylloxera is becoming a serious question with the Viticultural association of California and the pest occurs more or less through the eastern and middle parts of our country. On these accounts every new treatment against it is received with interest here and abroad.

A treatment devised against the phylloxera by the writer was reported upon last year [14 Dec. 1883] before the Biological society of Washington and a published notice of the discussion on remedies for the phylloxera at that meeting appeared in *PSYCHE* for Jan.-Feb. 1884, v. 4, p. 133-134, in which kerosene, applied by the nether-insertion process, was recommended as superior to naphthalin.

Those remarks were in response to communications by Prof. C. V. Riley and Prof. T. Taylor setting forth the

value of naphthalin as a remedy for the phylloxera. A partial description was there given of a nether inserter [without its handles and accessories] which I had previously constructed for inserting kerosene, but which was equally adapted for applying naphthalin. Omitting some important details and applications of this instrument, it may be added that in practice the device has operated with perfect satisfaction, as used by me in treating infested vines near Washington.

By the process of nether insertion and upward or volatile diffusion of that most infallible of all insecticides, petroleum, by its distillation and upward capillary dispersion in the ground, we have a treatment not only against the active insect but likewise against its summer eggs, which are also on the roots. The insecticides used against the active insect have not killed the eggs in sufficient number, and the survivors have hatched to restock the plants: hence to destroy both by one and the same application makes the treatment simple and more complete.

But the phylloxera also presents itself in a third phase for treatment, viz., in its winter eggs, which are different from the summer eggs and are deposited above ground. This brings me to another method of diffusing petroleum which I devised and reduced to practice

some years since, and which has proved of great value for freeing the orange groves of the scale insects. I allude to its emulsification with milk and water, whereby petroleum can be diluted to any suitable strength for insecticide purposes. The emulsion applied by a brush upon the parts where winter eggs are deposited will destroy them. When diluted, a spray of it over the entire plant in the winter season will do no harm. The winter eggs should be treated not later than February. The milk-kerosene process permits petroleum to be applied by the ordinary methods for insecticides. Emulsification with milk is also a recourse to slow and milden the intense action of the petroleum naphthas when placed in the ground.

Petroleum should be sprayed over the ground to destroy scattered eggs, and to reach the superficial larvae in the soil, but not, when undiluted, so as to flow undiffused upon the roots. When gradually dispersed above as spray and when inserted beneath the roots, the ground itself practically dilutes and diffuses the petroleum before it can reach the roots. The nether-upward kerosene diffusion process is the only economically practical way, of course, in which the deep application of the undiluted forms of petroleum can be attempted with safety to the plant. By it the cheap, crude article and its lighter form, the naphthas, become available as most valuable agents against the pests.

The nether-kerosene process applies likewise as a treatment against all other root insects or subterranean pests, as for

example, the American blight aphid [*Schizoneura lanigera*] the hop root gortyna [*Gortyna immanis*], root maggots of the cabbage, &c., the strawberry root beetles, cicadas, cut-worms, white grubs, wire worms, nests of ants, &c. Thus it is seen to have a general application to a wide range of cases heretofore not satisfactorily treated.

Besides the combined application of petroleum and the nether-insertion process, the latter and the inserters apply in combination with many other insecticides which have more or less efficiency in the cases cited, of which the following examples may be specially mentioned, viz.: rhigolene, gasolene, naphtha, benzine, kerosene, crude petroleum, oil of tar, tar water, naphthalin, pyroligneous acid, soot, creosote, carbolic acid, cresylic acid, sulphurous acid, sulphocyanide of potassium, bisulphide of carbon, cyanide of potassium, pyrethrum preparations, lye solutions, tobacco decoction, chips and snuff, water, gas water, liquid fertilizers, vapors, gases or fumes. The relative merits or advantages or disadvantages of these would involve lengthy discussion which may now be postponed, each has its special adaptation.

The nether inserters apply any upward acting insecticide against any underground enemies. Also I have provided certain accessories with which they in the same manner apply water or liquid manure to saturate the ground against *Phylloxera* or the other pests, and to fertilize the ground, to stimulate and diet up the plant: but these topics will be fully noticed at a later date.